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# COLOR PRINT DRYER COLOR SHEET FILM DRYER

25X1

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# TECHNICAL PROPOSAL

## COLOR PRINT DRYER
## COLOR SHEET FILM DRYER

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# SECTION I

# INTRODUCTION

# SECTION I
# INTRODUCTION

The drying operation of the photographic process involves the removal of moisture from the material so that an equilibrium is reached with the air in which the material is to be stored and handled. The best results are accomplished by natural evaporation; however, the process is much too slow. Techniques which reduce the drying time are usually accompanied by undesirable effects on the material such as curl, brittleness, distortion, and sensitometric changes. In recent years, color films and papers have placed even more stringent requirements on drying techniques because of their soft emulsion and many layers. The purpose of this program is to establish a rapid drying technique for sheet color films and papers which retains the product quality of natural evaporation.

The overall program is divided into two phases. Phase I is to be an investigation and design analysis of drying techniques with the objective of arriving at recommended techniques and demonstrating these techniques with breadboard hardware. Phase II will be a hardware prototype stage in which equipment suitable for operational use will be fabricated.

This proposal is confined to the Phase I effort and describes our approach to investigations of drying techniques for (a) sheet color film both negative and positive material, (b) matte drying of sheet color papers, and (c) gloss drying of sheet color papers.

It is anticipated that the Phase I effort will require approximately eight months and will consist of the following subphases:

A. Preliminary Investigation.
B. Test and Analysis Phase.
C. Preparation and Submission of Recommendation.
D. Development of Breadboard Hardware.

# SECTION 2

# TECHNICAL DISCUSSION

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# SECTION 2
# TECHNICAL DISCUSSION

## GENERAL CONSIDERATIONS

The goal of this program is to provide automated high quality rapid drying techniques for color sheet material. Considerable research has been and is being done to provide quality rapid drying methods for continuous roll black and white material. This is the result of pressures brought to bear in the motion picture, television, and aerial reconnaissance fields. A reasonably high level of technology has been established as is evidenced in investigation by Miller[1], Boyd[2], Michener[3], and others and [redacted] 25X1 [redacted] proposes to use this advantage. The requirements of this program then 25X1 are to expand the present technical level of rapid drying methods to include sheet color material. The prime considerations are the drying characteristics of the various color materials in use, the correlation of these characteristics with existing advanced drying techniques and the mechanical considerations of automation in the handling of soft color material in sheet form.

Photographic drying is a complex process of controlled moisture removal. It is generally accepted that optimum photographic and physical characteristics of films and papers are obtained when the materials are dried to a 50 percent relative humidity equilibrium. This does not mean that the moisture content of the various materials must be brought to the same point, since different materials have different moisture capacities. As an example, the amount of water to be removed from an acetate butyrate base is about seven times as great as from an estar base[4]. The problem then is that different materials vary widely both in their capacity for moisture in the processing phase and in their moisture content when in the optimum relative humidity equilibrium. Since undesirable changes occur when color materials are brought to equilibrium outside of the optimum range (40-60 percent), the drying requirements must be accurately determined and the drying rates closely controlled. Only with recent developments in infrared and microwave techniques has this degree of control been feasible. Self regulating feedback systems are feasible in which the drying energy level is controlled by the moisture content of the material. This is the key to optimum quality rapid drying and may allow both color film and paper drying to be accomplished in a single piece of equipment.

To accomplish the investigation and design analysis goals, [redacted] pro- 25X1
poses to divide the effort into four subphases.

<u>Subphase A. Preliminary Investigation</u>: This portion of the program will consist of those activities necessary to prepare for the test and analysis portion and will include such things as: (1) establishment of test requirements and measurement procedures, (2) drying techniques search, (3) accumulation of test equipment and materials, (4) analysis of material drying characteristics, and (5) establishment of experimental design parameters.

1. Establishment of Test Requirements and Measurement Procedures.

The analysis of drying techniques requires the determination of drying rates and an assessment of the resulting quality. Establishment of measuring techniques and quality levels are required in the following area:

- (a) Moisture Content
- (b) Physical Characteristics
  - (1) Dimensional (overall and local)
  - (2) Curl
  - (3) Brittleness
  - (4) Abrasion
  - (5) Peeling
  - (6) Water marks
  - (7) Surface texture
- (c) Sensitometric Characteristics
  - (1) Density
  - (2) Color
  - (3) Mottle

The ability to accurately measure moisture content in this investigation is of considerable importance. The desired moisture content must be established for each color material in terms of equilibrium relative humidity. The drying rates required to bring each material to this optimum condition can then be determined and compared for each of the drying techniques analyzed. Several moisture measurement techniques are known; however, the electrical hygrometer technique appears to offer the most potential to this investigation. The advantages of this method are (1) speed of measurement and calibration, and (2) convenience in use, as readings are obtained directly in terms of relative humidity which eliminates the need for moisture equilibrium curves. More detailed information on this subject can be found in Colton and Weigand's paper on "Moisture in Photographic Film and Its Measurement"[5].

The analysis of resulting physical and sensitometric characteristics in the quality control consideration of this investigation. A rapid drying technique is of little value if the product is physically or sensitometrically changed. Most of the undesired physical conditions are readily apparent or can be determined by available ASA Standards procedures. Dimensional change measurements are probably the most complex. [redacted] 25X1
[redacted] proposes to use the moire' cancellation method in which both local and 25X1
overall dimensional changes can be quantitatively determined. The principle involves the registration of a master halftone screen to a screen on the test material. Irregularities in the formed moire' pattern are used to determine the location and magnitude of dimensional changes. This method has been used and described on several occasions by people in the Film Testing Division of Eastman Kodak Company[6].

2. Drying Techniques Search

The purpose of this portion of the investigation is to accumulate as much information as possible with reference to drying techniques. This will be done through (1) literature search, (2) manufacture search, and (3) laboratory testing. The choice of the drying techniques to be tested under the Test and Analysis Subphase will be based on this investigation. Emphasis will be placed on advanced techniques which show potential in the color field. Such techniques are characterized by selective energy absorption, positive and instantaneous energy control, elimination of surfaces-to-interior energy transfer, and cold source energy.

[redacted] engineers have been involved in photographic drying problems for 25X1
several years and are presently involved as a monitoring agency on an Air Force development program in ultra-rapid microwave film drying technique.

The type of rapid drying technique to be investigated will include but not be limited to the following.

1. Air Impingement
2. Infrared Radiation
3. Chemical Displacement
4. Dielectric
5. Microwave

Equally important during the search phase is the consideration of automated sheet material transport techniques. Color sheet film has been successfully dried in the Kodak RT Versamat processor using roller transport. The transport mechanism of other processors such as the Krecnite Agi-flo, Rolor Transflo, Pakorol, and Log-E-flo will be investigated.

Plans are to consider color paper matte drying under the same conditions as film with the hope that one method or piece of equipment can be designed to do both jobs. Gloss drying of color paper will be considered separately both in terms of initial drying and as an emulsion rewet system.

3. Accumulation of Test Equipment and Materials

The anticipated requirement for equipment and materials falls into three general classes: (1) measurement and instrumentation apparatus for use in the test and analysis phase and (3) drying equipment utilizing the techniques to be investigated.

As often as possible access to existing equipment or manufacturers' development models will be pursued; however, in some of the more advanced techniques, test models may have to be fabricated.

4. Analysis of Material Drying Characteristics

Dryer requirements are based on the amount of moisture absorbed in the processing. The amount of moisture absorbed is dependent upon the type of material, processing treatment, and use and storage environment. By performing an analysis of drying characteristics of the color materials, the range of dryer requirements can be established. Materials to be tested will include: Ektachrome, Ektacolor, Ektacolor Print Film, Ektaprint C, Ektaprint R, Anscochrome and Printon. Depending on the results of these tests, it may be possible to establish the extremes and choose two materials which represent this range for use in the test and analysis phase.

5. Establishment of Experimental Design

Near the end of this subphase, decisions will have been made regarding the test procedures and the techniques to be analyzed and will permit a final experimental design to be established for the Test and Analysis phase. At this time the requirements for statistical confidence will be determined and the necessary ANOVA tables prepared.

Subphase B. Test and Analysis: It is during this phase that the potential techniques found in the search effort will be tested and analyzed. Three general areas will be investigated: (1) the drying techniques, (2) the resulting quality and (3) the operational considerations.

Under the drying technique, such things as drying rate, energy control, and moisture level monitoring will be considered. The quality requirements will be established as outlined earlier while the operational consideration will include such things as size, weight, cost, power requirement, mechanical complexity, and automation potential.

The test portion will consist of a closely controlled sequence of investigation for each technique. Color material used for testing purposes will be exposed to a test frisket composed of neutral areas, step tablets and halftone screen background. These sheets will be exposed and processed under recommended conditions just prior to the test. These sheets will then be cut lengthwise and one-half will be placed in a 70° F 50 percent RH enclosure to be dried by natural evaporation for reference purposes. The other half will be the test material to be used with the various drying techniques. Sufficient samples will be tested to insure valid results.

Comparison will be made of the drying rates and resulting quality for various conditions within each technique and between techniques.

Subphase C. Preparation and Submission of Recommendations: The data generated in the test phase will be reduced and analyzed and a report of the findings prepared. At the end of this phase a meeting will be scheduled in which the capabilities and limitations of all systems will be presented along with our recommendations regarding the technique or combination of techniques which we feel offers the greatest potential.

<u>Subphase D. Development of Breadboard Hardware</u>: Upon the customer's approval of the technique choice, [redacted] engineers will design and fabricate 25X1 a breadboard model to adequately demonstrate the system. This model, though not finished operational hardware, will possess design features which will contribute to the Phase II fabrication effort.

## REFERENCES

1. Miller, Dana, "Rapid Drying of Normally Processed Black and White Motion Picture Film", S.M.P.T.E., Feb. 1953.

2. Boyd, J. W., "Rapid Drying Characteristics of Several Films for Aerial Photography", PSE, 4, No. 6, 354-358 (1960).

3. Michener, B. C., "Drying of Processed Aerial Films", Photogrammetric Engineering, Vol. XXIX, No. 2, 321-326 (1963).

4. Op. cit, p. 323.

5. Colton, E. K., Wiegand, E. J., "Moisture in Photographic Film and Its Measurement", PSE, 2, No. 3, 170-176 (1958)

6. Adelstein, P. Z., Leister, D. A., "Non-Uniform Dimensional Changes in Topographic Aerial Films", Photogrammetric Engineering, Vol. XXIX, No. 1, 149-161 (1963.

# SECTION 3

# PROGRAM ORGANIZATION

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## SECTION 3
## PROGRAM ORGANIZATION

If this program is awarded to [redacted] it will be assigned to the Physical 25X1
Services Laboratory under [redacted] will be the project 25X1
engineer. [redacted] will be assigned as the electronic engineer with [redacted] 25X1
[redacted] serving as the photoscientist. Assistance in mathematical analysis and 25X1
computer programming, if necessary, is available from the Systems Analysis Department. Mechanical design and model shop facilities are available as required for fabrication of the Breadboard Equipment.

Since its organization in 1955, [redacted] has specialized in applied research, 25X1
test, evaluation and product improvement programs involving reconnaissance and intelligence equipment. The present staff of approximately one hundred ninety-five people includes ninety-eight professionals and eighty-five highly skilled technicians and supporting personnel with experience in reconnaissance equipment and associated technologies.

The company has specifically avoided entering into competition with production suppliers to permit emphasis on applied research, test, evaluation and development of special purpose instrumentation.

This program in itself will not require the hiring of additional engineering personnel. Unforeseen problems requiring skills and technical experience which the aforelisted personnel do not possess may arise. In that event, other personnel available within our company structure and consultant staff will be assigned as necessary to
break these problem areas. [redacted] Vice President of Research and 25X1
Engineering is an example of the level of individual we have available in this category.

This task fits ideally into our company structure and long range planning. A large percentage of our effort has gone into the test and evaluation of printers, driers processors and all other types of ground support equipment for reconnaissance systems. The experience gained in these programs and our more recent color programs will permit us to avoid the mistakes and problem areas contained in earlier versions of equipment.

Moreover, since we do not compete in the production area, we are not trying to sell a particular product. Rather, we can take advantage of all of the known techniques, thus resulting in a better product for the customer

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# SECTION 4

# PERSONNEL QUALIFICATIONS

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# SECTION 5

# PROGRAM SCHEDULES

# SECTION 5
# PROGRAM SCHEDULES

## PROPOSED PROGRAM OUTLINE

Phase I. Investigation and Design Analysis of Rapid Drying Techniques for Color Sheet Material.

(3 months) Subphase A. Preliminary Investigation

1. Establishment of Test Requirements and Procedures
   - (a) Moisture Content
   - (b) Physical Characteristics
     - (1) Dimension
     - (2) Curl
     - (3) Brittleness
     - (4) Abrasions
     - (5) Peeling
     - (6) Water Marks
     - (7) Surface Texture
   - (c) Sensitometric Characteristics
     - (1) Density
     - (2) Color
     - (3) Mottle
2. Drying Techniques Search
   - (1) Literature
   - (2) Manufacturer
   - (3) Laboratory Test
3. Accumulation of Test Equipment and Materials
   - (1) Measurement and Instrumentation
   - (2) Color Materials and Chemistry
   - (3) Drying Equipment
4. Analysis of Material Drying Characteristics
5. Establishment of Subphase B Experimental Design

(2 months) Subphase B. Test and Analysis

(1 month) Subphase C. Preparation and Submission of Recommendations

1. Drying Technique(s)
2. Mechanical Design

(2 months) Subphase D. Development of Breadboard Hardware

1. Design
2. Fabrication
3. Testing

<u>Phase II.</u> Development of Prototype Hardware

## PROGRAM SCHEDULE

| | ACTIVITY | MONTHS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | MAN MONTHS ENGR. | MAN MONTHS TECH. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A | *PRELIMINARY INVESTIGATION* | | | | | | | | | 6 | 3 |
| B | *TEST AND ANALYSIS* | | | | | | | | | 4 | 3 |
| C | *PREPARATION AND SUBMISSION OF RECOMMENDATIONS* | | | | | | | | | 1 | 1 |
| D | *DEVELOPMENT OF BREADBOARD HARDWARE* | | | | | | | | | 3 | 2 |
| | | | | | | | | TOTAL | | 14 | 9 |

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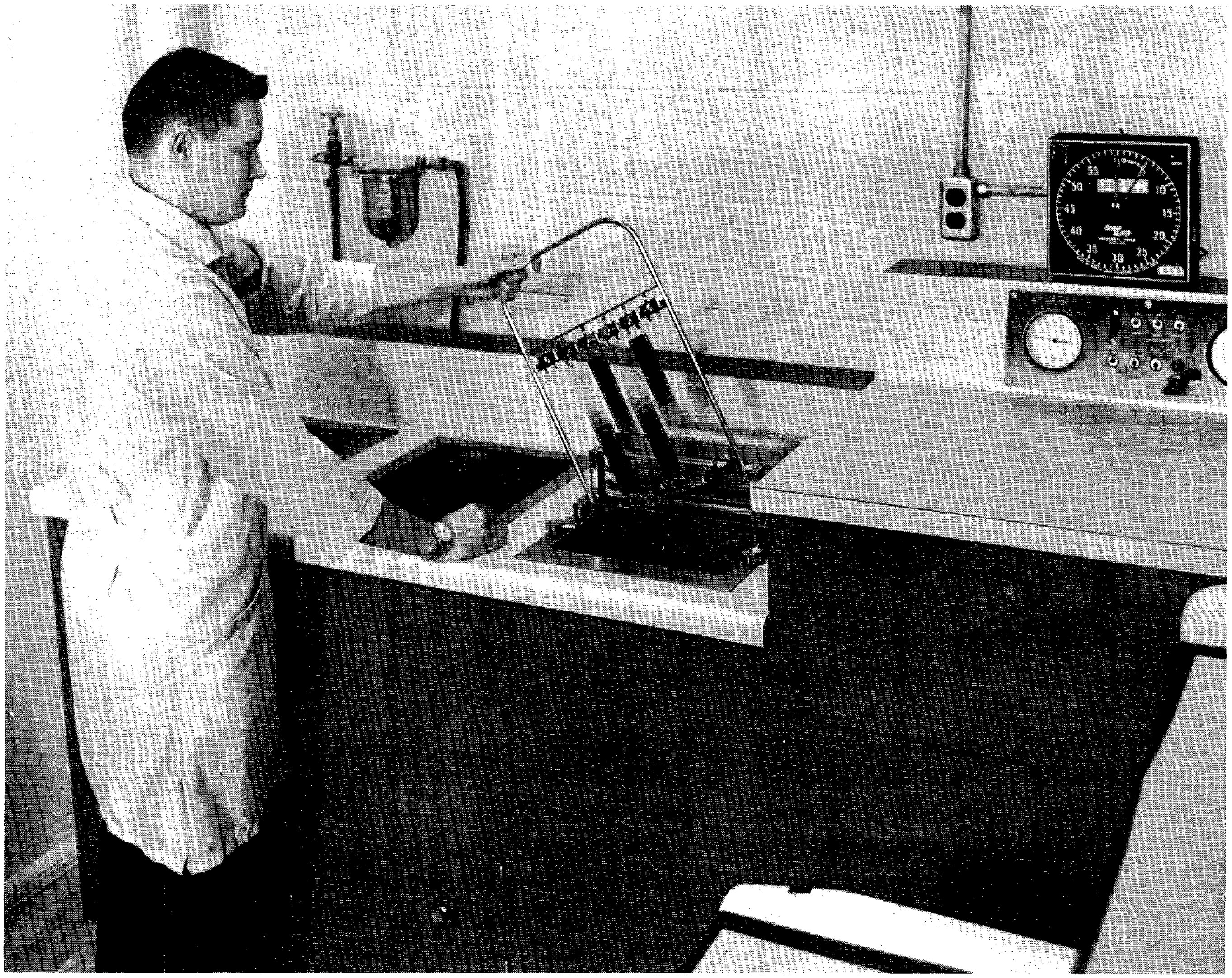
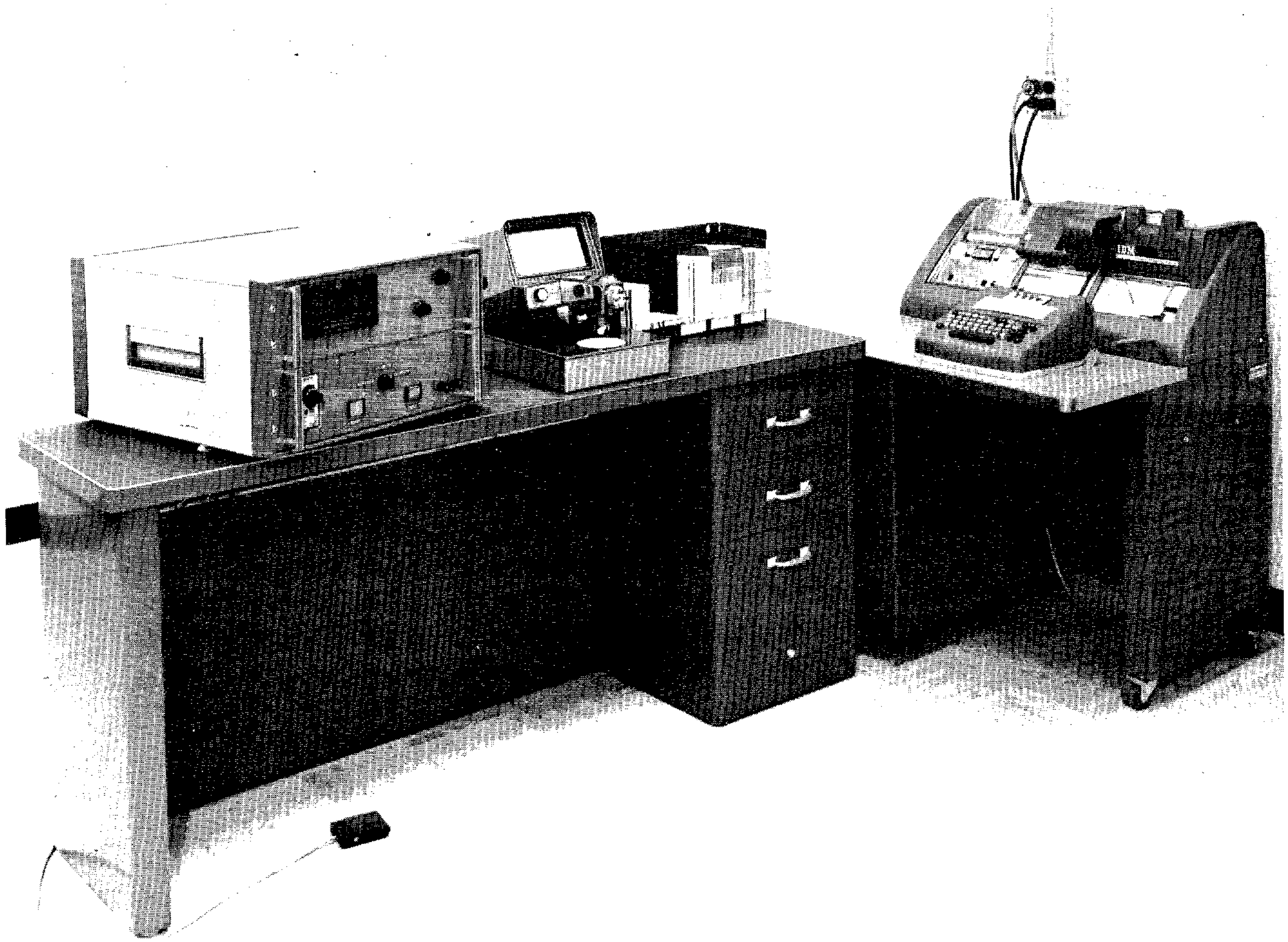
# SECTION 6

# QUALIFICATIONS AND EXPERIENCE



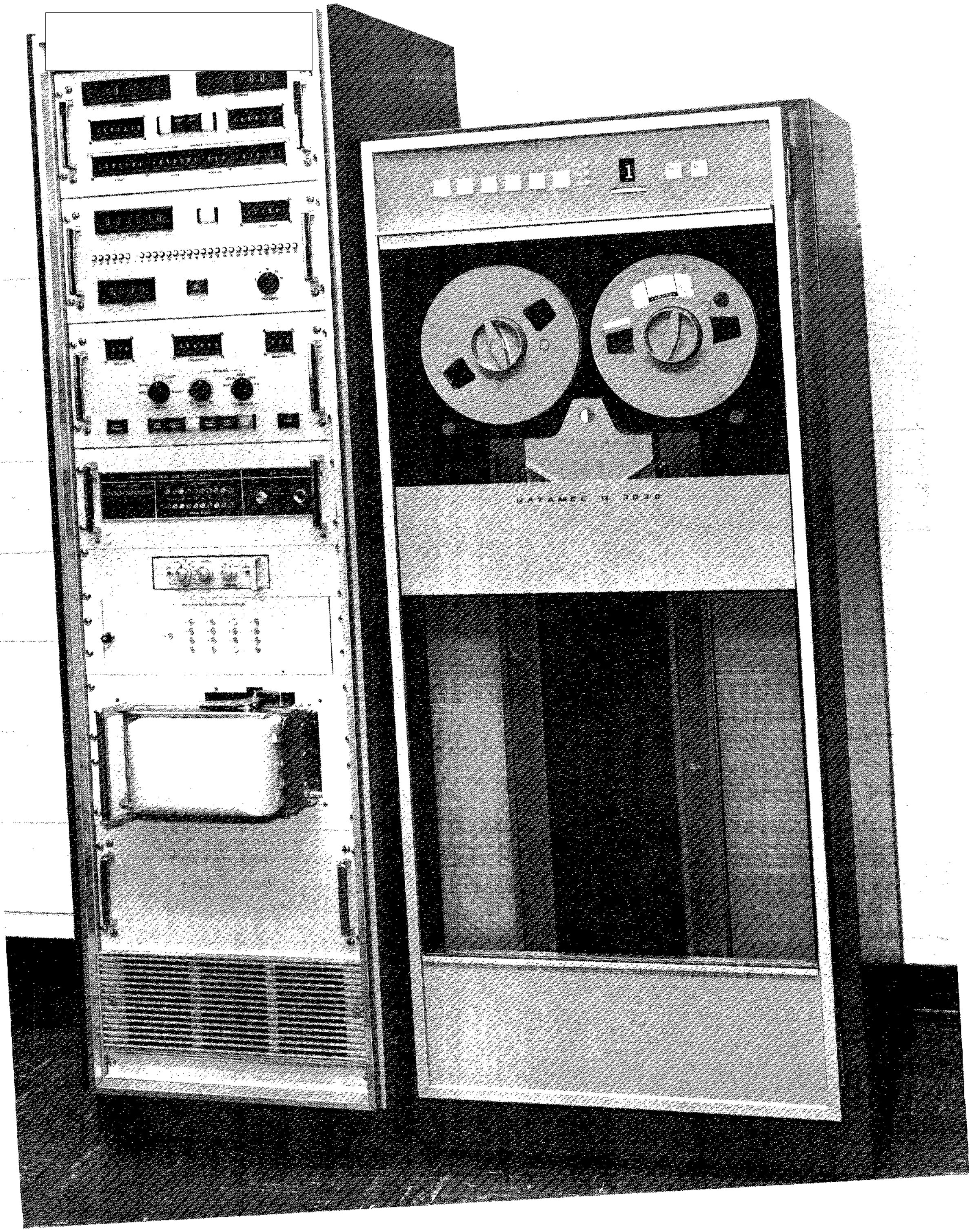
**SENSITOMETRIC PROCESSOR**

This processor was designed and built by  to maintain sensitometric control on all film tests. Paddle agitators are precisely controlled for stroke rate in chemical baths with temperatures controlled within ± .1° F. Stop baths and rinse tanks are included to permit complete processing in one unit. 25X1



## DIGITIZED DENSITOMETER

[redacted] has designed a digitizer to permit printout of density directly on an IBM 526 card punch. Standard 21 step sensitometric strips are recorded directly on an IBM card with printout. The cards are then available for computer manipulation. 25X1



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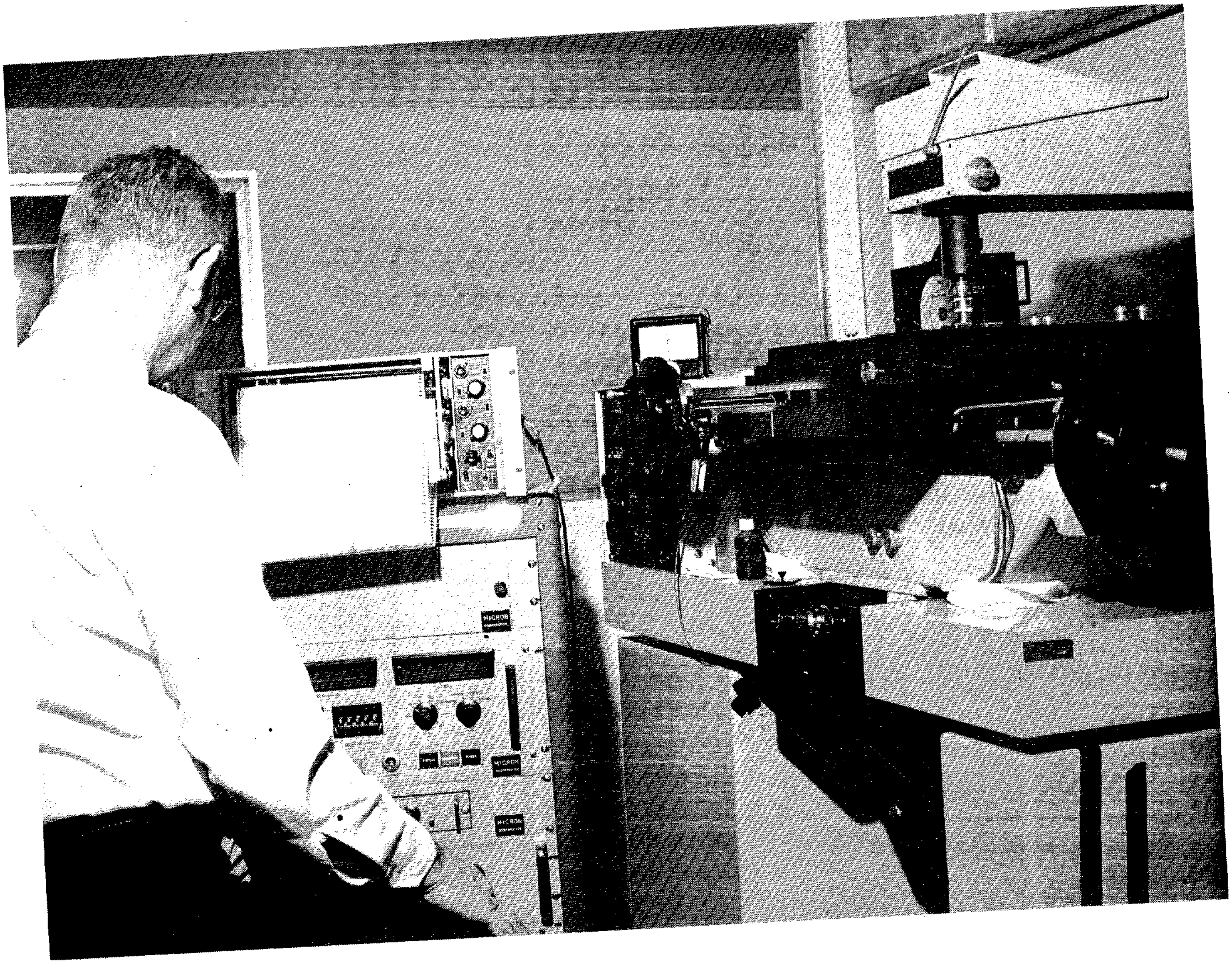
## DIGITIZERS

Magnetic tape and paper tape digitizers are used to read out Micro-Analyzer outputs. These units were designed and built by 25X1 to provide flexible inputs to the computers. Included are programming features for automatic sensitometric readouts, random scanning, spot sampling, automatic area sampling and cut-off.



## MICRO ANALYZERS

Two analyzers are located in absolute vertical flow clean room areas. The analyzers are programmable for random scanning. Output in either density or transmittance is digitized or transmitted directly into a computer. Scan speeds can be varied from 25 microns/minute to 25 millimeters per minute. Areas as small as one micron in diameter can be analyzed with densities above 3. Slits and other aperture shapes are also interchangeable. Roll or cut film may be analyzed. Frequency response of logarithmic amplifiers of over 3 KC permits scanning of extremely small areas at relatively high speed. Mensuration precision while scanning is better than .3 microns. Over 50 lens systems are available at [redacted] to permit a highly versatile analysis system with these analyzers. 25X1

# SECTION 7

# FACILITIES AND EQUIPMENT

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# SECTION 7

## FACILITIES AND EQUIPMENT

The facilities [redacted] have been systematically designed so as to 25X1 assure the "in-house" availability of all equipment which is necessary to pursue applied research programs involving theoretical study, laboratory analysis, and design and fabrication of prototypes, if necessary. [redacted] 25X1 These facilities comprise sixty-thousand square feet 25X1 of floor area housed principally in two (2) buildings. A TOP SECRET clearance has been granted to the company for these facilities.

The company's facilities are oriented towards work in the areas of photography, electronics, optics, mechanics, and combinations of these fields. The companies facilities include a photosecience laboratory, computational facilities, electronics laboratory, optics laboratory and machine shop.

We have complete Engineering Design and Model Shop facilities. Our Engineering Design facility is manned by 2 Senior Designers, 3 Designers, and 4 Draftsmen. Our Model Shop employs 6 full time model makers. In view of our specialty of reconnaissance all of these people are imminently qualified in the sciences and technologies which surround our area of specialty.

More complete descriptions of a representative sampling of our facilities is included in the following pages.

# MECHANICAL DESIGN AND MODEL FABRICATION

[redacted] has devoted about 3600 sq. ft. of its facility to provide an in-house design and fabrication capability. A design room staffed with designers having diversified backgrounds and a modern model shop employing highly skilled model makers combine to offer idea-to-prototype hardware capability in a range of optical-electromechanical devices. 25X1

During the latter part of October 1966, this group will move to a new 4500 sq. ft. controlled environment building. Extension of the precision capabilities of this group, was of prime consideration in the design and layout of this new facility.

Following is a list of the major equipment in the model shop:

| | |
|---|---|
| 1 | Hardinge turret lathe, 1" collet cap |
| 1 | Monarch lathe, 14" swing, 30" center distance |
| 1 | LeBlond "Regal" lathe, 15" swing, 42" center distance |
| 1 | South Bend lathe, 10" swing, 24" center distance |
| 2 | Bridgeport mills, 9" x 30" table |
| 3 | Bridgeport model 12BEJ mills, w/standards |
| 1 | Cincinnati shaper, 16" stroke |
| 1 | Cincinnati model 2MH horizontal mill |
| 1 | Hammond surface grinder w/6" x 18" magnetic chuck |
| 1 | Delta super hi-sensitive drill press |
| 1 | Toolroom bench drill press |
| 1 | Fosdick toolroom floor drill press |
| 1 | 10" rotary table |
| 1 | 18" rotary table |
| 1 | 10" B&S dividing head |
| 1 | Racine cutoff saw - 6" x 7" cap |
| 1 | Sevrit cutoff saw (non-ferrous) |
| 1 | DoAll model ML band saw |
| 1 | Walker Turner pedestal grinder |

MECHANICAL DESIGN AND MODEL FABRICATION (Cont'd)

| | |
|---|---|
| 1 | Carbide tool grinder |
| 1 | Belt sander |
| 1 | FAMCO No. 3-1/2 R arbor press |
| 1 | 48" capacity metal brake |
| 1 | 24" capacity metal brake |
| 1 | 24" capacity metal shears |
| 1 | Diacro No. 2 punch |
| 1 | Diacro notcher |
| 1 | Miller model 61M arc welder |
| 1 | Treet-all hevi-duty heat treat furnace, 2000°F w/full controls |
| 1 | Treet-all hevi-duty lab type heat treat furnace, 2000°F. |
| 1 | Clark hardness tester |
| 1 | Pratt and Whitney electro limit gauge w/GE electric gauge head |
| 1 | Preis Panto Engraver w/masters |
| | Misc: Inspection quality surface plates, height gauges, gauge blocks, electric and pneumatic hand tools, acetylene welding and brazing equipment. |

## ELECTRONICS LABORATORY

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[redacted] has devoted 4,000 square feet of space for the design, testing, and fabrication of electronic prototypes. The company has available the following electronic test equipment:

| | |
|---|---|
| 35 ea. | Ammeters, A.C., D.C., of various ranges and manufacturers |
| 9 ea. | Philbrick Operational Amplifiers |
| 4 ea. | Audio Amplifiers |
| 1 ea. | General Electric Brightness Meter |
| 1 ea. | Weston Brightness Meter |
| 7 ea. | Brightness and Color Temperature Standard Bulbs |
| 17 ea. | Capacitor Decades and Substitution Boxes |
| 1 ea. | Ballentine AC-DC Calibrator |
| 3 ea. | Standard Cells |
| 1 ea. | Hewlett Packard 522B Electronic Counter |
| 2 ea. | Computer Measurements Corporation Electronic Counter |
| 2 ea. | Leeds and Northrop Galvanometer |
| 4 ea. | Inductor Decades |
| 17 ea. | Simpson Multimeters |
| 1 ea. | Berkley Electronic Correlator |
| 1 ea. | Hickock SG299 Oscillator |
| 1 ea. | Hewlett Packard Audio Oscillator |
| 1 ea. | Hewlett Packard Low Frequency Function Generator |
| 1 ea. | Federal R.F. Oscillator |
| 1 ea. | Tektronix Square Wave Generator |
| 6 ea. | Tektronix Oscilloscopes |
| 26 ea. | DC Voltage and Constant Current Power Supplies |

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Electronic test equipment (continued)

| | |
|---|---|
| 1 ea. | Leeds and Northrop K-2 Potentiometer |
| 1 ea. | General Radio 1217C Pulse Generator |
| 1 ea. | Leeds and Northrop Model 4760 Resistance Bridge |
| 11 ea. | Resistance Decade and Substitution Boxes |
| 1 ea. | Leeds and Northrop Shunt Box |
| 1 ea. | General Radio Strobotac |
| 3 ea. | Transistor Testers |
| 1 ea. | Sensitive Research Corporation Volt-Amp-Wattmeter |
| 1 ea. | Leeds and Northrop Volt Box |
| 20 ea. | Voltmeters A.C., D.C., of various ranges |
| 1 ea. | Fluke Model 821 Differential Voltmeter |
| 1 ea. | Fluke Model 801 Differential Voltmeter |
| 8 ea. | Vacuum Tube Voltmeters |
| 2 ea. | Weston Wattmeter |
| 1 ea. | Photon Instrument Six Channel Recorder |
| 1 ea. | Eight Channel Sanborn Recorder |
| 1 ea. | Leeds and Northrop Wheatstone Bridge |
| 1 ea. | Kintel Model 301 Voltage Standard |
| 2 ea. | Kintel Model 203 Microvolt-Ammeter |
| 1 ea. | Supreme Electronics Tube Tester |
| 1 ea. | Heath Model RC-1 Radiation Counter |

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## PHOTOSCIENCE LABORATORY

[redacted] photographic laboratories cover over 7,000 square feet of floor space. The entire area is under rigid temperature and humidity control. Temperature is maintained at $70^{\circ}$ F $\pm$ $2^{\circ}$ F and humidity at 50% $\pm$ 5% RH. All air entering the laboratory area is filtered to remove dust and dirt particles larger than 5 microns. 25X1

The laboratory complex includes black and white continuous processing rooms, black and white printing rooms, studio areas serving both black and white and color requirements, color processing and printing rooms, a photographic chemistry laboratory, a chemical mixing area, and a fully equipped sensitometric testing laboratory. In addition to these specially equipped and constructed facilities, there are darkroom areas available for use in research and development activities and other general photographic applications.

All continuous black and white aerial film processing is handled with the three Eastman Kodak Versamat processors installed [redacted] Rigid quality control is maintained over these machines through sensitometric evaluation and chemical analysis and control. Color film processing is accomplished with the use of the Zeiss FE 120 Processor. Printing for both black and white and color is accomplished using printers manufactured by LogEtronics, Morse, Miller-Holzwarth, Omega, Bessler, and Durst. Also, [redacted] has fabricated and modified existing equipment for use in high resolution printing. 25X1 25X1

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[redacted] sensitometric laboratory includes a Data Sensitometric Processor, an Eastman Kodak Model 1B Sensitometer, A Welch Duplex Densitometer, and MacBeth TD 100 and 102 Densitometers. In addition, [redacted] has a MacBeth TD 102 Densitometer that has been coupled to a digital display and an IBM Summary Punch. Density values read with this equipment are automatically printed and punched on IBM cards which may then be fed directly into a computer for automatic sensitometric evaluation. 25X1

In addition to the laboratory areas already described, [redacted] maintains five Whitfield clean rooms. These filters have removed 99.97 per cent of all 25X1 particles larger than 0.3 microns. These rooms are set up for total darkness operation. Because of the nature of this area, it lends itself to the fabrication of image standards and image evaluation. Two pieces of equipment contained in this laboratory, and unique to our effort in the sensitometric and image evaluation field, are the Mann Data Micro Analyzer, and the Data Model 1248 Digitizer. Both of these pieces of equipment were developed by [redacted] and represent a fundamental breakthrough in the art of photometric and sensitometric target analysis for the evaluation of photographic recording emulsions and camera lens performance. 25X1

The Mann Data Micro Analyzer is a highly accurate recording microdensitometer. It has the ability to scan automatically an area as large as 8 x 10 inches. The instrument has the capability to read the density of an area one (1) micron in diameter to values of density higher than 4.0. A chart recorder is supplied for continuously recording the analog output of the instrument which is, in fact, the density of the material scanned. The Data Model 1248 Digitizer is used for digitizing the analog output. The digitizer displays the density in digital form and utilizes a paper tape punch to produce a permanent record of the digitized data. In this manner, data from the Micro Analyzer are reduced directly to a form that is acceptable for computer input for subsequent mathematical analysis. With the in-house availability of these two pieces of equipment, [redacted] has the ability to evaluate the sensitometric characteristics of photographic recording emulsions over large areas and to reduce the evaluation to a quantitative number. 25X1

[redacted] also has available two David Mann Corporation Step and Repeat Printers. These extremely high precision instruments are used to produce resolution targets and micro step wedges. 25X1

## PHOTOGRAPHIC CHEMISTRY LABORATORY

[redacted] analytical laboratory facilities are fully equipped and staffed with the trained personnel to carry out chemical research programs in the major areas of the photographic process. This laboratory has investigated optical sensitizing dyes for high resolution emulsions, both soluble and insoluble aromatic overcoatings to be used to protect image standards, qualitative and quantitative analysis of complex developer formulas, conventional chemical process control techniques, formulation of unconventional specialized developer formulas aimed at fine grain and high contrast photographic response, and the formulation and use of color coupler developer systems. 25X1

The laboratory is equipped with a Beckman DU-2 Spectrophotometer, an International centrifuge, an Ainsworth analytical chain balance, a constant temperature water bath, a Beckman Model 76 pH meter, several mechanical stirrers, a full complement of laboratory glassware, and an adequate supply of chemical reagents. Furthermore, the laboratory is equipped to carry out elution, gravimetric, titrimetric, and spectral analyses.

## LIGHT STANDARDS LABORATORY

This facility includes 250 square feet of floor space completely enclosed and pressurized. The pressurized air is filtered of all foreign particles above 5 microns in size and special maintenance procedures insure a high level of cleanliness for use of optical instruments. The interior of this room is painted completely with lamp black nonreflecting paint.

The laboratory is utilized primarily for calibration of secondary light sources, as well as light detectors, against our primary light standards. These primary sources are calibrated for color temperature, horizontal candle power and luminous flux by the National Bureau of Standards. This room is ideally suited for making very low level light measurements. Other support equipment for this laboratory include a 36 inch integrating sphere, a precision ruled 8 foot photometer bench and a brightness meter with its own calibration standard.